Remarks

The amendment to the Specification

This amendment is being made to bring the terminology used in Applicants' Specification into better conformity with general technical usage. In general technical usage, a *syntactic foam* is a foam which contains spheres of a material such as glass. The purpose of the spheres is to keep the foam from collapsing under pressure. The mixture of microballoons and adhesive described at col. 3, lines 57-59 of Bishop is an example of such a syntactic foam. When heat is applied to a syntactic foam such as the one in Bishop, it expands no more than is dictated by the rate of expansion of its component balloons and adhesive.

As pointed out at page 7, line 28 of Applicant's Specification, "The particular syntactic foam employed in the preferred embodiment is Loctite SynSpand 9899". A copy of Alex Wong, *Process model for SynsSpand syntactic film*, Technical Paper, Loctite Aerospace accompanies this response. The Introduction to the paper gives an overview of the characteristics and behavior of SynSpand. As is apparent from the terminology of the introduction, SynSpand is properly termed an *expandable syntactic film*; accordingly, Applicants have amended their Specification to replace the term "expanding syntactic foam" with the term "expandable syntactic film". Because Loctite SynSpand is in fact an expandable syntactic film, the amendment adds no new matter.

The amendments to the claims

<u>The amendment to claim 17</u>

Claim 17 is being amended to point out that the element located between the mold and the tubes is an expandable element, i.e., one that has the function of expanding during the cure, and to point out the effect of the element's expansion on the lay-up. The claim as amended is fully supported by the Specification as filed. See in particular page 6, lines 10-16.

The amendment to claim 18

The amendment is fully supported by the Specification as filed. See p. 6, lines 22-24. As amended, the claim clearly distinguishes between the mold and the silicon which is the expansive element that is located between the mold and the tubes, and thus overcomes the rejection under 35 U.S.C. 112, 2. paragraph.

The amendment to claims 19, 21, and 22

Here, the claim term "expanding foam" has been replaced by "expandable syntactic film". For the reasons set forth above with regard to the amendment to the Specification, claims 19 and 22 as amended are fully supported by the Specification as filed.

Patentability of the amended claims over the combination of Bishop and Baron

What the references disclose

The disclosure of Bishop

Bishop discloses a technique for making a bicycle frame out of tubes that are held together by lugs made of woven graphite fiber. The process used to make the frame is described beginning at column 3, line 29. It uses a mold of which one half, indicated by the reference number 20, is shown in FIG. 2. As shown in FIG. 4, to make the frame, you first lay two sheets of impregnated graphite fabric into the hollow provided in the mold for the lug. Then you fill the areas between the hollows with mixture 42, which is a putty-like mixture of microballoons and adhesive. The purpose of adding mixture 42 is to make fillets between the tubes being joined by the lug, as may be seen from col. 2, lines 66-68. The next stage is to put 4 more sheets of fabric into the hollows and over mixture 42 (see FIG. 6). You do the same with the other half of the mold. Then you wrap the frame with two sheets of fabric at the location of the lug. Finally, you put the wrapped frame into the mold, put the other half of the mold on top, and bolt the halves together. As is clear from col. 5, lines 4-10 and 13- 22 and FIG. 6, showing "flash" 40, the halves of the mold do not completely enclose the frame. Pressure can thus be brought to bear on the layers simply by tightening the bolts. The lugs set at room temperature by exothermic action.

The disclosure of Baron

Baron is not concerned in any way with making bicycle frames or even with joining tubes generally. Baron is instead concerned generally with molding very large structures made from sheets of composite materials and more particularly with techniques for applying pressure to the composite materials while they cure. The problems he is solving arise from the fact that the structures are so large that it is not practical to construct molds that can be bolted together to apply pressure to the composite materials while they cure.

Baron's technique is set forth in overview at col. 2, line 65 through col. 3, line 60. The portion of the technique which is relevant in the present context is described in overview at col. 3, lines 39-51, which Examiner cites in his rejection of the claims in his first Office action in the RCE:

> Between the inner mold and the layup is a layer of silicon rubber, having printed circuit heaters thereon sandwiched between additional layers of silicon rubber. Placed on the outside of the layup are a plurality of segmented silicon rubber sheets formed to the other contour of the part which, may also incorporate printed circuit heaters. The layers of silicon rubber expand when heated and apply compaction pressure as well as isolate the layup from the inner and outer molds during the cure cycle. The outer mold can also incorporate printed circuit heaters thereon to add additional heat to the silicon rubber.

Put simply, when the silicon rubber layers are heated, they expand against the layup and the wall of the mold and thereby compact the layup.

Patentability of claim 17 as amended over Bishop and Baron

As presently amended, claim 17 reads as follows:

> **17.** (currently amended) A method of making lugs for joints in a bicycle frame made of carbon fiber tubes,
> the method comprising the steps of:
> making a lay-up of at least carbon fibers and a matrix material around the joint,
> applying a mold to the tubes and laid-up fibers and matrix material, and

> curing the lug in the mold, the cure including expansion of an expandable element located between the mold and the tubes, the element's expansion serving to compact the lay-up.

The claim now expressly points out that the element that expands during the cure is an *expandable* element, that is, an element that has the function of expanding during the cure, and that the effect of the element's expansion is to compact the lay-up. These limitations serve to clearly distinguish claim 17 from the disclosure of Bishop. There is no indication whatever in Bishop that mixture 42 is an "expandable element", i.e., has the function of expanding during the cure or that any expansion that mixture 42 may experience during the cure "serv[es] to compact the lay-up", both as required by claim 17. That being the case, Bishop does not disclose all of the limitations of claim 17.

Examiner finds the "expandable element" in the heatable silicon rubber layers that Baron uses to compact the layup for his large structures and then adds, "It would have been obvious to one of ordinary skill in the art to incorporate this teaching of Baron into the method of Bishop in order to efficiently provide a force or compaction pressure to force components of the layup into firm contact with each other." (First Office action in the RCE, ¶2, bottom).

Applicant's attorney respectfully traverses this finding of obviousness. To begin with, because Bishop's mold does not completely surround the frame, it already *has* a way to "efficiently provide a force or compaction pressure to force components of the layup into firm contact with each other", namely by tightening the bolts or otherwise forcing the sides of the mold closer together. Because that is the case, one skilled in the art would not be motivated to add Baron's silicon rubber layers to Bishop's mold.

Baron is more relevant to molds which cannot be tightened around the object they are molding, so that compression has to come from the expansion of an element within the mold, rather than by tightening the mold. The difficulty here is that the techniques disclosed in Baron are not usable for making lugs for bicycle frames. One reason for this is a matter of simple scale: expansion elements that are useful in Baron's huge molds are

simply not usable in the much smaller molds used to make bicycle lugs. For example, while Baron does not specify the thickness of his silicon rubber layers, the fact that they are thick enough to include printed circuit heaters means that they will be too thick and too inflexible to be usable within the relatively small confines of the molds used to make bicycle lugs.

The problems flowing from the difference in scale between bicycle frame lugs and housings for hovercraft fans are increased by the nature of the joints in a bicycle frame and consequently of the lugs used with those joints. In a bicycle frame, the tubes have relatively small diameters and come together at the lugged joint at angles that are often quite sharp. In order for the compaction to be effective, it must be applied with expandable elements that are thin and flexible enough not only to fit smoothly along surfaces having the relatively small diameters of the frame's tubes and of the mold that fits around the tubes but are also able to fit into the angles where the tubes come together. Nothing could be further the large-radius curves of the molds in which Baron employs his silicon rubber layers than the curves and angles of a lugged joint and the molds for the lug and it is difficult to see how Baron's silicon rubber layers could be tailored to fit into the molds and around the frame's tubes or how how printed circuit heaters could be adapted to such tailored layers.

Because there is no motivation for a user of Bishop's mold to incorporate an expandable element into it, and because the silicon rubber layers that serve as expandable elements in Baron's enormous molds are not usable to make bicycle lugs, Applicant's claim 17 as amended cannot be rendered obvious by the combination of Bishop and Baron, and consequently, claim 17 is patentable over the references.

Patentability of the dependent claims

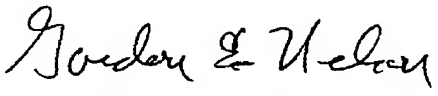
Continuing with the dependent claims, the arguments that apply to claim 17 also apply to claim 18. There is no disclosure at all in either Baron or Bishop of including the expandable element in the layup (claim 24) the use of a layup including expanding syntactic film to make lugs (claims 19, 21, and 22), and consequently, these claims are

patentable in their own rights over the references. There is further no disclosure in Bishop of the characteristic of the wrapping technique of claim 20 that "the ends of the fabric extend[] beyond the tube" or the characteristic that the ends are wrapped "around the tube the given tube joins to", so claim 20, too, is patentable in its own right over the reference.

Conclusion

Applicant has amended his Specification and claims to conform certain terminology to standard usage and has amended claim 17 to better distinguish it from Bishop and claim 18 to overcome the rejection under 35 U.S.C. 112, second paragraph. Applicants have shown that the claims as amended are fully supported by the application as filed and are patentable over the references. Applicant has consequently been fully responsive to Examiner's Office action of 4/3/06 and Applicant consequently respectfully requests that Examiner enter the amendment and allow the claims as amended.

Respectfully submitted,



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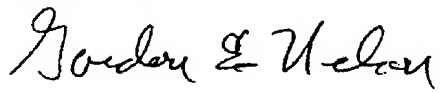

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